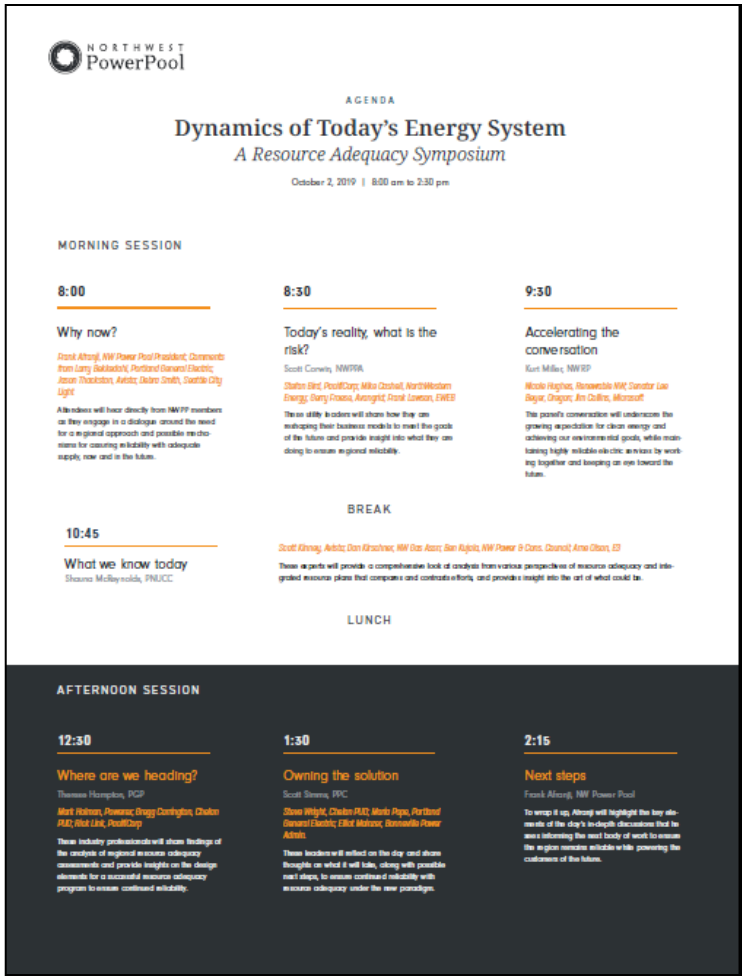
Regional Adequacy – On the Minds of Regional Energy Leaders

October 2nd Northwest Pool Symposium:

- It's a shared regional challenge.
- There is urgency.



NORTHWEST PowerPool

AGENDA

Dynamics of Today's Energy System

A Resource Adequacy Symposium

October 2, 2019 | 8:00 am to 2:30 pm

MORNING SESSION

8:00 Why now?

Frank Afranji, NW Power Pool President; Comments from Larry Rabinowitz, Portland General Electric; Jason Thackston, Avista; Debra Smith, Seattle City Light

Attendees will hear directly from NWPP members as they engage in a dialogue around the need for a regional approach and possible mechanisms for ensuring reliability with adequate supply, now and in the future.

8:30 Today's reality, what is the risk?

Scott Corwin, NWPPA

Stefan Bird, PacifiCorp; Mike Cashell, NorthWestern Energy; Barry Frousa, Avangrid; Frank Lawson, EWEB

Three utility leaders will share how they are reshaping their business models to meet the goals of the future and provide insight into what they are doing to ensure regional reliability.

9:30 Accelerating the conversation

Kurt Miller, NWRP

Nicole Hughes, Renewable NW; Senator Lee Beyer, Oregon; Jim Collins, Microsoft

This panel's conversation will underscore the growing expectation for clean energy and achieving our environmental goals, while maintaining highly reliable electric services by working together and keeping an eye toward the future.

BREAK

10:45 What we know today

Shauna McReynolds, PNUCC

Scott Kinney, Avista; Dan Kirschner, NW Gas Assn; Ben Kujala, NW Power & Cons. Council; Arne Olson, E3

These experts will provide a comprehensive look at analysis from various perspectives of resource adequacy and integrated resource plans that compare and contrast efforts, and provide insight into the art of what could be.

LUNCH

AFTERNOON SESSION

12:30 Where are we heading?

Theresa Hampton, PGP

Mark Ralston, Powerex; Bragg Carrington, Chelan PUD; Rick Link, PacifiCorp

These industry professionals will share findings of the analysis of regional resource adequacy assessments and provide insights on the design elements for a successful resource adequacy program to ensure continued reliability.

1:30 Owning the solution

Scott Simms, PPC

Steve Wright, Chelan PUD; Mario Pape, Portland General Electric; Elliot Mainzer, Bonneville Power Admin.

These leaders will reflect on the day and share thoughts on what it will take, along with possible next steps, to ensure continued reliability with resource adequacy under the new paradigm.

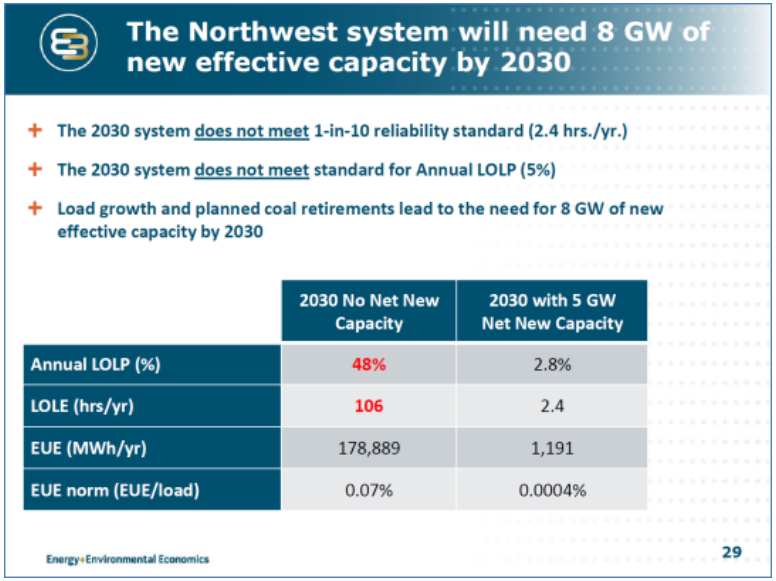
2:15 Next steps

Frank Afranji, NW Power Pool

To wrap it up, Afranji will highlight the key elements of the day's in-depth discussions that be used informing the next body of work to ensure the region remains reliable while powering the customers of the future.

Analysts Show Varying Results, But All Agree: PNW Faces a Significant Capacity Gap

- E3 estimates a **gap of 8 GW** by 2030.
- The Northwest Power and Conservation Council estimates a **Loss of Load Probability of 33% by 2024** (5% is the standard).



The Northwest system will need 8 GW of new effective capacity by 2030

- The 2030 system does not meet 1-in-10 reliability standard (2.4 hrs./yr.)
- The 2030 system does not meet standard for Annual LOLP (5%)
- Load growth and planned coal retirements lead to the need for 8 GW of new effective capacity by 2030

	2030 No Net New Capacity	2030 with 5 GW Net New Capacity
Annual LOLP (%)	48%	2.8%
LOLE (hrs/yr)	106	2.4
EUE (MWh/yr)	178,889	1,191
EUE norm (EUE/load)	0.07%	0.0004%

Energy+Environmental Economics

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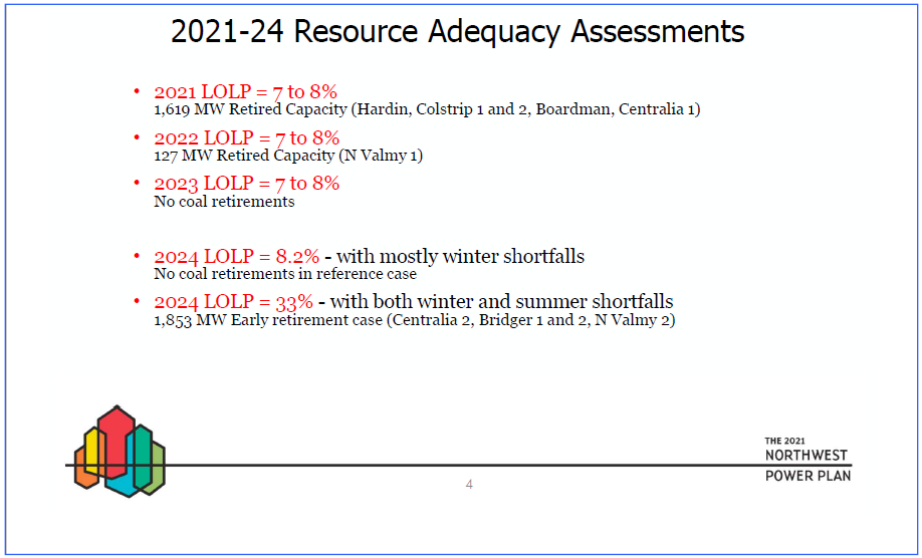

2021-24 Resource Adequacy Assessments

- 2021 LOLP = 7 to 8%
  1,619 MW Retired Capacity (Hardin, Colstrip 1 and 2, Boardman, Centralia 1)
- 2022 LOLP = 7 to 8%
  127 MW Retired Capacity (N Valmy 1)
- 2023 LOLP = 7 to 8%
  No coal retirements
- 2024 LOLP = 8.2% - with mostly winter shortfalls
  No coal retirements in reference case
- 2024 LOLP = 33% - with both winter and summer shortfalls
  1,853 MW Early retirement case (Centralia 2, Bridger 1 and 2, N Valmy 2)

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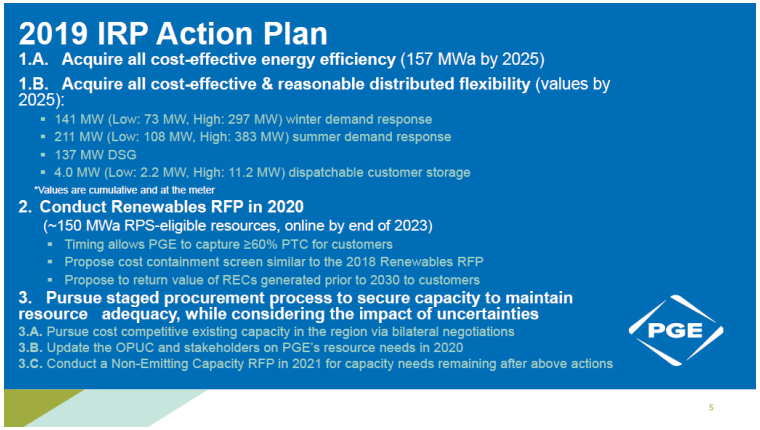
THE 2021 NORTHWEST POWER PLAN

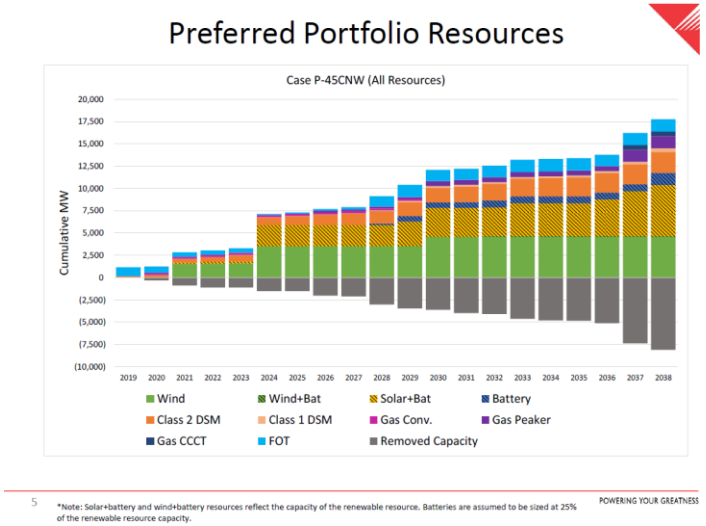
Northwest Power and Planning Council Presentation, Oct. 2 2019 Symposium

And Utilities are Building New Resource Types into their Plans

- Multiple tools, including **"distributed flexibility"**, are being used to fill the gap.

- For example, **PGE** is aggressively acquiring DR in their IRP over the next five years, while **Pacificorp** is adding more DR and storage (mostly paired) to their mix.





2018 Potential Study Found 2,000+ MW of Achievable DR in BPA's Public Service Territory

- 19 products were modeled along a cost curve (20 year levelized).
- Quantity of achievable DR was estimated using regional data and national benchmarks for reasonable penetration.

Product	Summer			Winter		
	Summer Achievable Potential (MW)	Percent of Area System Peak—Summer	Levelized Cost ($/kW-year) Summer	Winter Achievable Potential (MW)	Percent of Area System Peak—Winter	Levelized Cost ($/kW-year) Winter
Residential DLC—Space Heating	0	0.0%	N/A	214	1.4%	$52
Residential DLC—Water Heating*	259	2.0%	$167	354	2.3%	$122
Residential Water Heater Timers*	194	1.5%	$98	264	1.7%	$72
Residential DLC—CAC	166	1.3%	$71	0	0.0%	N/A
Residential DLC—Smart T-stat*	147	1.1%	$47	268	1.7%	$85
Residential BYOT*	39	0.3%	$80	75	0.5%	$42
Residential CPP	57	0.4%	$12	168	1.1%	$10
Residential Behavioral DR	13	0.1%	$111	37	0.2%	$110
Small Commercial DLC	15	0.1%	$108	14	0.1%	$56
Med Commercial DLC	55	0.4%	$25	23	0.2%	$32
Commercial Lighting Controls	55	0.4%	$32	44	0.3%	$32
Commercial Thermal Storage	9	0.1%	$51	0	0.0%	N/A
Industrial Curtailment	315	2.4%	$29	311	2.0%	$29
Large Commercial Curtailment	196	1.5%	$42	133	0.9%	$42
C&I Interruptible Tariff	69	0.5%	$73	62	0.4%	$73
Industrial RTP	5	0.0%	$34	5	0.0%	$35
Large Farm Irrigation DLC	323	2.5%	$36	n/a	n/a	n/a
Small/Medium Irrigation DLC	219	1.7%	$50	n/a	n/a	n/a
DVR	232	1.8%	$14	392	2.6%	$14
Total*	**2,369**	**18.3%**		**2,363**	**15.4%**	

Source: March 19, 2018 Cadmus DR Potential Study. Update Published September 2019.

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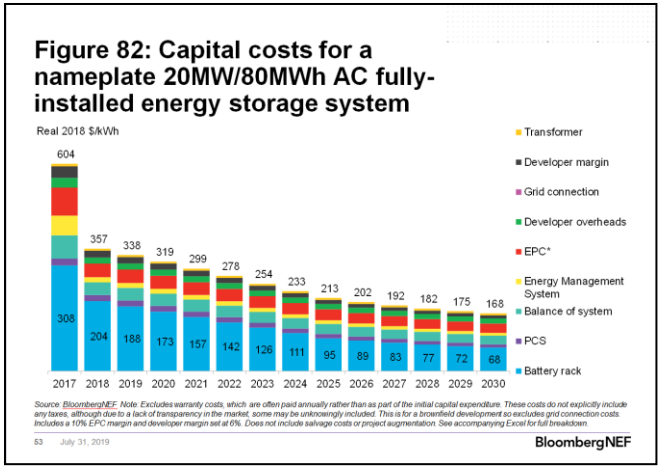
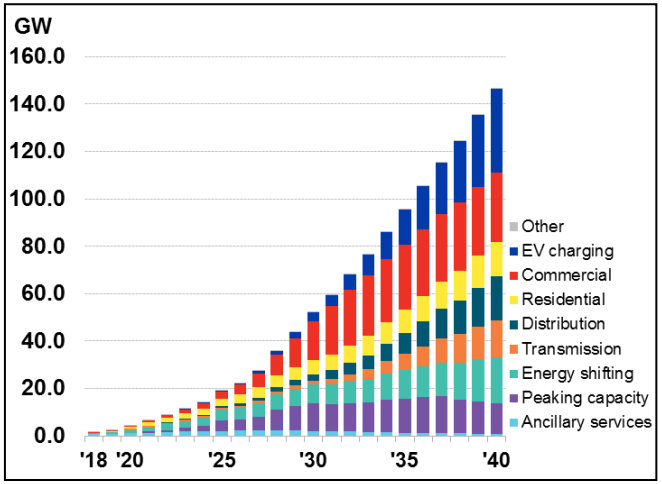
Batteries Will Play a Role on the Grid

- Batteries **prices continue to fall** (30-50% more in the next 10 years), and deployment expected to rise 3x by 2020.

- BPA has a battery focused initiative (2017-present), and appreciates the partnership with utilities to explore battery uses.



Source: Lithium Ion Battery Costs, Bloomberg NEF, 2019 Long-Term Energy Storage Outlook, July 31, 2019.



Source: Bloomberg NEF 2018 Long-Term Energy Storage Outlook 11/15/2018

What's Next for BPA and DER

- Continue the dialogue with customer utilities on innovative programs and DER learnings.
- Work with the BPA Resource Program (2020 Program) on how DERs may fit into future capacity needs.
- Work with the Power Council (and the Demand Response Advisory Committee) on assumptions for the coming 2021 Power Plan.
- Evaluate opportunities for new types of grid assets, e.g. utility scale batteries, to provide cost effective solutions for BPA Power and Transmission (e.g. Non-Wires Alternatives)
- Questions? Use DER@bpa.gov or contact Lee Hall: ljhall@bpa.gov